

TRIFOLIUM STOLONIFERUM,
RUNNING BUFFALO CLOVER:
DESCRIPTION, DISTRIBUTION, AND CURRENT STATUS

RALPH E. BROOKS

Running buffalo clover, *Trifolium stoloniferum* Muhl. ex A. Eaton (Fabaceae) is one of three species of this temperate genus indigenous to the eastern United States. Since this little known and perhaps extirpated species was described in 1818, its distribution has been variously and often erroneously reported and its taxonomic status questioned. While the species was collected with some regularity during the 1800's from eastern Kansas to West Virginia, *T. stoloniferum* has been collected a mere five times since 1900, most recently in 1940 (Webster County, West Virginia). The current interest in rare and endangered species, coupled with the varied literature accounts, led to the current investigation of the characteristics and current status of *T. stoloniferum*.

METHODS

Despite consulting field botanists in the region where *Trifolium stoloniferum* was known to occur and making field excursions to past collection sites, my efforts to locate extant populations of the plant have proven futile. Thus this investigation is based entirely on herbarium specimens and available literature.

Herbaria at more than 50 institutions, as well as several private collections, were consulted during the course of this study. The herbaria consulted are listed according to the acronyms of Holmgren et al. (1981) (an asterisk (*) indicates no specimens found; a double asterisk (**) indicates no response to the loan request): BGSU*, BH**, BHO*, BUT**, CINC, CLM, CM, DS, F, GH, IA, ILL, IND*, IS, ISC, ISM*, ISU**, JHWU, KANU, KE, KNK*, KSC*, KSP*, KSTC*, KY, LYN*, MCA*, MO, MU, MUR*, MUS*, MWI*, NEB, NDG*, NY, NYS, OC, OKL*, OKLA*, OS, PH, PHIL, PUR, SDSU*, SDU*, SIU*, SMS*, SMU*, SWMT*, TENN*, UARK, UCHT*, UMO, US, VDB*, VIP*, VT, WAB**, WVA, YUO, Baldwin-Wallace College, Berea, Ohio*, and Urbana College, Urbana, Ohio*.

TAXONOMIC HISTORY

Henry Muhlenberg originally named *Trifolium stoloniferum* in 1813, in his *Catalogus Plantarum Americae Septentrionalis*. Muhlenberg's new name was, however, invalid since the name was published without a description (nomen nudum). Three years after Muhlenberg's death Amos Eaton published *Manual of Botany for the Northern and Middle States* (ed. 2) and therein validated Muhlenberg's name by publishing a description of the plant. While Eaton (1818) alluded to a type specimen, it was neither clearly designated nor has original material ever been located. In view of this a neotype was recently selected (Brooks, in press).

DESCRIPTION

The majority of botanists describing *Trifolium stoloniferum* have had few specimens from which to work. Eaton (1818) in preparing the original description and McDermott (1910) in his work with North American *Trifolium* each had but a single specimen from which to write his description. As a result past descriptions are generally brief and less than informative. The description which follows was prepared after examining all the specimens discovered during this investigation:

***Trifolium stoloniferum* Muhl. ex A. Eaton (Fig. 1)**

Perennial (probably short-lived), stoloniferous herbs with short subterranean or superficial branching caudex; sometimes with 1 (2) scapose flowering stems from the base; stolons 0.5–3 (6) dm long, rooting at the nodes, glabrous to rarely sparsely puberulent. Leaves basal or alternate on stolons, trifoliolate; leaflets obovate to orbicular or obcordate, (8) 20–30 (40) mm long, nearly as wide, glabrous to rarely sparsely pubescent, apex rounded to usually subtruncate and shallowly or evidently retuse, margins serrulate-denticulate; petioles (1) 3–8 (15) cm long, glabrous or puberulent; stipules usually adnate 1/2 or more of length to petiole, lanceolate to ovate-lanceolate, the free portion narrowed to the apex or somewhat abruptly acuminate or cuspidate, glabrous. Flowering stems scapiform, erect, ebracteate, 1–2 from base or solitary from the axils of the stolons, 6–15 (22) cm tall, usually lightly pubescent near the summit, with 2 leaves near the apex; peduncles 1 (2) from the apex of the stem, 2–6 cm long, glabrous to evidently pubescent; inflorescence subglobose,

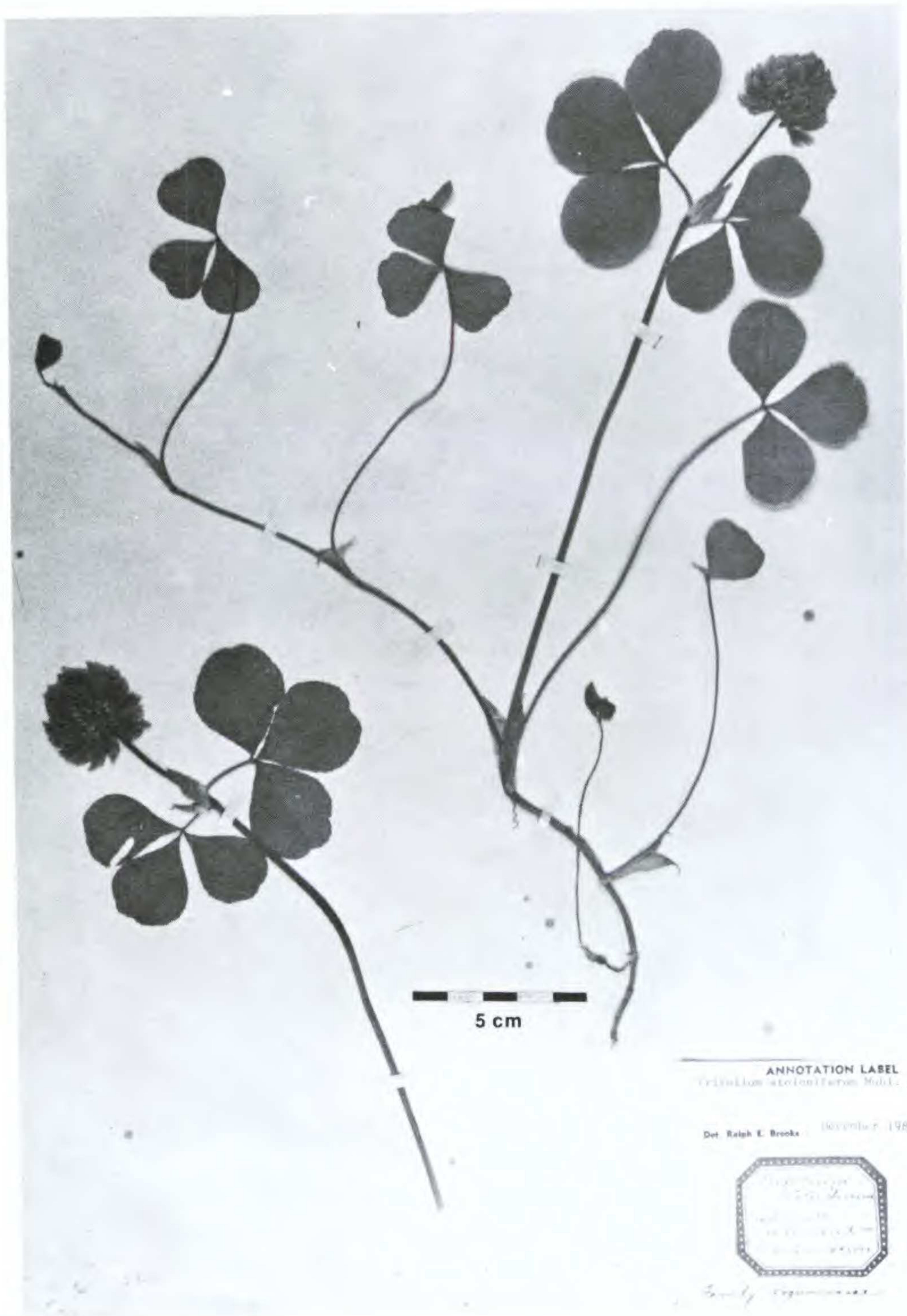


Figure 1. *Trifolium stoloniferum*.

(1.5) 2.5–3.5 cm diam, with the central axis (2) 4–8 mm long, 20–60 flowered. Flowers 9–12 mm long, soon reflexed; pedicels 2–10 mm long; calyx-tube campanulate, slightly gibbous at the base, 1.5–2.5 mm long, 5-nerved, glabrous or evidently pubescent, the lobes slightly unequal, subulate, (2.5) 3–4 (4.3) mm long, glabrous to pubescent, rarely ciliate; petals white, possibly tinged with pink or purple; standard obovate to obcordate, (8) 9–10 (12) mm long; wings 6–7 mm long, claws 2–3 mm long, ovary short stipitate, elliptic-oblong, 2.5–3 mm long, apically pubescent; ovules 2; style abruptly recurved at the apex, 2.5–3 mm long. Legume oblong, strongly margined, short stipitate, 3–4 mm long, apically pubescent, 1 (2) seeded; seeds dull yellow brown or darker, subreniform, 1.7–2.0 mm long, smooth. Flowering mid-Apr–Jun; fruiting May–Jul.

The habit of *Trifolium stoloniferum* is remotely similar to *T. reflexum* L. and *T. repens* L., a fact attested to by the numerous past reports based on specimens of one or the other of these two species. Gray (1867) wrote of *T. stoloniferum*, "probably a variety of the last [*T. reflexum*]," and most recently Isley (in press) stated, "...one cannot wonder if it [*T. stoloniferum*] is naught an uncommon genetic form of that species [*T. reflexum*]." While admittedly the sample size of *T. stoloniferum* is rather limited, the characters used to distinguish *T. stoloniferum* from *T. reflexum* and *T. repens*, as outlined in Table 1, appear stable.

DISTRIBUTION

When originally named, *Trifolium stoloniferum* was said to occur in Ohio, Kentucky, and Pennsylvania (Muhlenberg, 1813) and Eaton (1816) added western New York. None of these early records can, however, be validated since Muhlenberg's collections were without data and Eaton apparently included the species on another person's word. Of those four states only Kentucky and Ohio were later found to harbor *T. stoloniferum*. Later collections from more western stations increased the known distribution gradually, and sometimes erroneously, with the widest distribution given by Fernald (1950), "W. Va. to S.D., s to Ky., Mo., and e. Kans."

On the basis of specimen evidence accumulated in the present study the range of *T. stoloniferum* may now be modified to include eight states (Fig. 2): Arkansas, Illinois, Indiana, Kansas, Kentucky,

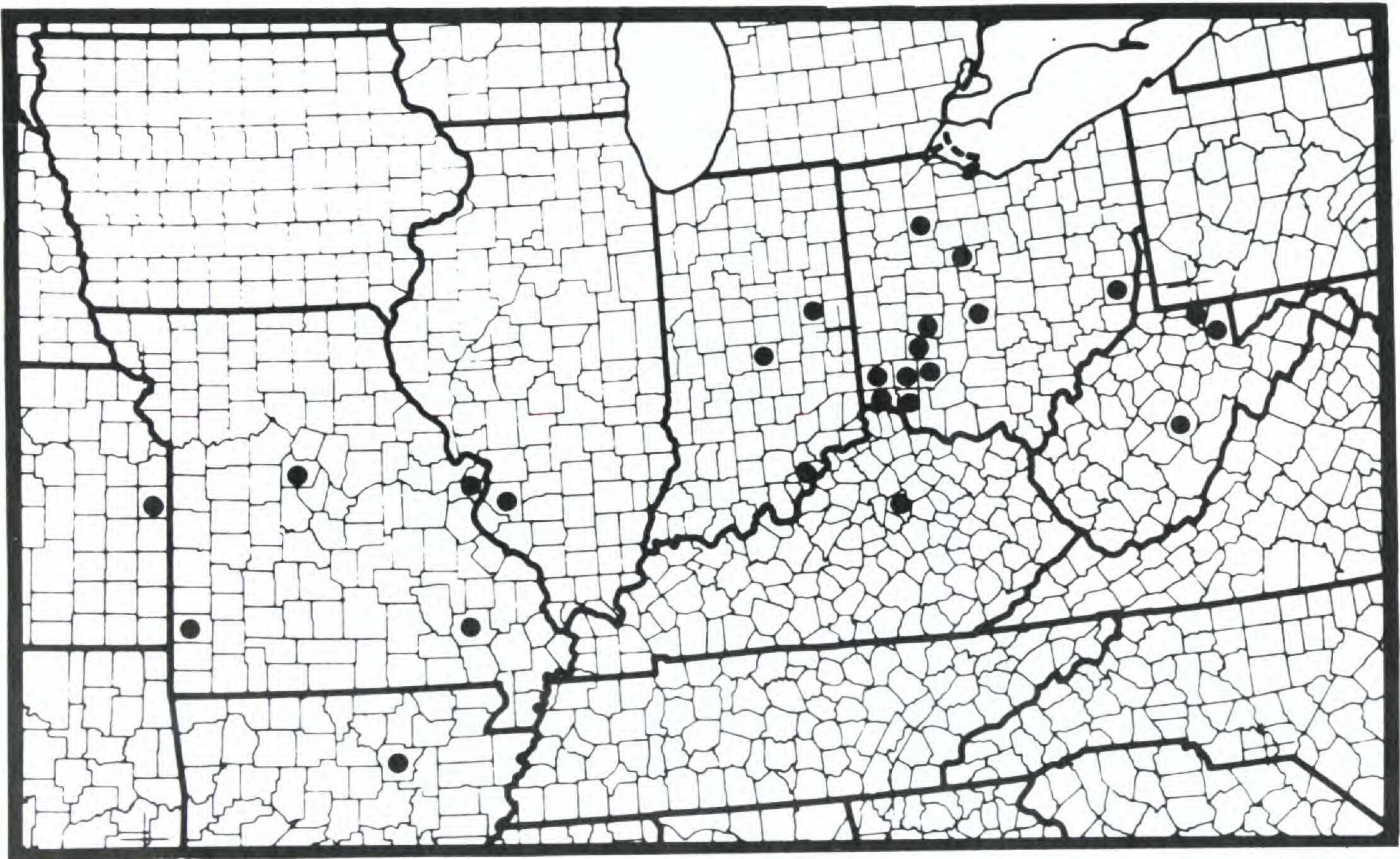


Figure 2. Distribution of *Trifolium stoloniferum*.

Table 1. Characters distinguishing *Trifolium stoloniferum*, *T. reflexum*, and *T. repens*

Character	Character States		
	<i>T. stoloniferum</i>	<i>T. reflexum</i>	<i>T. repens</i>
1. Habit	stoloniferous	non-stoloniferous	stoloniferous
2. Leaflets	widely obovate to orbicular or obcordate, nearly as wide as long	obovate, oblong, or elliptic, usually much longer than wide	widely obovate to obcordate, nearly as wide as long
3. Flowering Stems	unbranched, scapiform, bearing a pair of leaves in the upper portion and 1 (2) flowering heads from the apex	leafy and frequently branched, 1 to several flowering heads borne from the upper axils	unbranched and naked with a solitary flowering head (a scape)
4. Calyx	calyx-teeth 2-4× as long as the tube	calyx-teeth 2.5-4× as long as the tube	calyx-teeth 1-1.5× as long as the tube
5. Seeds	1.7-2.0 mm long, smooth	1.2-1.5 mm long, obscurely verruculose or with minute irregular ridges	1-1.3 mm long, smooth

Missouri, Ohio, and West Virginia. The earliest dated collection found was made in 1830, near St. Louis, Missouri, by L. C. Beck. Thereafter, the plant was collected at scattered sites throughout its range, especially in the later 18th century. The two most recent collections were both made in West Virginia, one in 1937, in Preston County and the other in 1940, in Webster County.

Specimen-documented records of *T. stoloniferum* include the following:

ARKANSAS. **Independence Co.:** on railroads, 23 Apr 1896, *H. Eggert s.n.* (MO).

ILLINOIS. **St. Claire Co.:** Cahokia, 1 Jun 1890, *herb. N. M. Glatfelter s.n.* (MO).

INDIANA. **Clark Co.:** Charlestown, May 1880, *herb. A. H. Young s.n.* (PH). **Delaware Co.:** woodlands, May 1882, *W. W. Canby s.n.* (NY). **Marion Co.:** open woods, Jun 1876, *E. F. Shipman s.n.* (F, PH).

KANSAS. **Miami Co.:** 10 Jul 1884, *J. H. Oyster s.n.* (MU); Jul 1885, *J. H. Oyster s.n.* (DS, F, MU, NY).

KENTUCKY. **Fayette Co.:** Lexington, fields, May 1834, *R. Peter s.n.* (NY); 1835, *C. W. Short s.n.* (GH); May (no yr.), *C. W. Short s.n.* (F, KY, NY, PH); 10 May 1882, *W. A. Kellerman s.n.* (KANU, KSC); no date, *C. W. Short s.n.* (CLM, KY, PH).

MISSOURI. **Cooper Co.:** 5 miles above Booneville on the Missouri River, 1883, *Suckley s.n.* (GH, US). **Jasper Co.:** Carterville, common along streams, 21 May 1907, *B. F. Bush 561* (MO). **St. Louis Co.:** near St. Louis, 1830, *L. C. Beck s.n.* (NYS); Allenton, May 1880, *G. W. Letterman s.n.* (GH); big spring near Allenton, 15 May 1880, *J. H. Kellogg s.n.* (NY); Allenton, alt. 500 ft., 10 May, 1882, *G. W. Letterman s.n.* (F, NY NEOTYPE, PH, UMO, US); Allenton, 16 Jul 1885, *J. H. Kellogg s.n.* (MO); May 1887, *G. W. Letterman s.n.* (F); 20 May 1896, *G. W. Letterman s.n.* (NY); Eureka, Clifly Creek, 18 May 1901, *J. H. Kellogg s.n.* (MO, US). **Wayne Co.:** woods north of Williamsville, 16 May 1893, *H. Eggert s.n.* (MO).

OHIO. **Belmont Co.:** Barnesville, 20 May 1906, *E. E. Laughlin s.n.* (OS); edge of Stur's woods, low ground, *E. E. Laughlin 999* (KE); 22 May 1907, *E. E. Laughlin s.n.* (GH). **Butler Co.:** Oxford, 1887, *J. F. James s.n.* (OS). **Clark Co.:** Springfield, 1878, *E. J. Spence s.n.* (OS); Jun 1882, *H. Martin s.n.* (JHWU). **Clermont Co.:** Miamiville, 25 May 1877, *J. F. James s.n.* (OS); no date, *J. F. James s.n.* (US); Batavia Junc., 22 May 1884, *J. F. James s.n.* (CINC). **Clermont-Warren Cos.:** Loveland, Jul 1877, *D. L. James s.n.* (ILL). **Clinton Co.:** Wilmington, 1876, *D. L. James s.n.* (OS). **Franklin Co.:** Columbus, insane asylum grounds, 1890, *A. D. Shelby s.n.* (OS); 8 Jun 1882, *W. S. Devol s.n.* (OS); 27 May 1895, *W. A. Kellerman s.n.* (OS). **Greene Co.:** Yellow Springs, 24 May 1870, *herb. J. Y. & T. L. Bergen s.n.* (G). **Hancock Co.:** Williamstown, 1834, *herb. J. P. Paddock s.n.* (ILL). **Hamilton Co.:** Spring Grove, Cincinnati, 9 May 1878, *J. F. James s.n.* (OS); Mt. Echo, Cincinnati, 1878, no collector (CINC); near Cincinnati, 15 May 1880, *C. G. Lloyd s.n.* (PH, US); 1881, *C. G. Lloyd s.n.* (US); 25 May 1882, *C. G. Lloyd s.n.* (NYS); 3 Jun 1883, *C. G. Lloyd s.n.* (PH); 3 Jun 1884, *C. G. Lloyd s.n.* (CINC); 21 May 1886, *C. G. Lloyd s.n.* (CINC, ILL, OC); 27 May 1888, *C. G. Lloyd s.n.* (MO); Cincinnati, 31 May 1879, *herb. A. P. & L. V. Morgan s.n.* (NY, US); no local, 1 Jun 1882, *T. H. Kearney, Jr. s.n.* (OS); North Bend, fernbank in woods along Ohio River, no date, *C. W. Short s.n.* (MO); Ferris Woods, dry fields, no date, *herb. E. L. Braun s.n.* (US).

WEST VIRGINIA. **Monongalia Co.:** Manilla, 29 Jun 1905, *J. L. Sheldon 1640* (WVA). **Preston Co.:** Cheat River, 6 Jun 1937, *Mr. & Mrs. H. A. Davis 924* (private collection of H. A. Davis, Freeport, FL). **Webster Co.:** Back fork of Elk River in dry open woods, 6 Jun 1940, *Mr. & Mrs. H. A. Davis 3748* (WVA).

Erroneous and Undocumented Records

In evaluating the distribution of *Trifolium stoloniferum* it is felt that discounting erroneous records is of some significance. Therefore the following list of erroneous or undocumented reports is presented with reference to where the report was made and the reason for its dispensation. An asterisk (*) following the state indicates that *T. stoloniferum* is documented from another station in the state.

ILLINOIS*

Isley (in press): Augusta (Mercer Co.), based on *T. reflexum*.

IOWA

Rydberg (1932), Steyermark (1963): no specimen documentation; the sheets found (Iowa City, Jun 1889, *Hitchcock* (F); Iowa, Jul 1865, Mary Treat Coll. (MUS)) were *T. reflexum*.

Fitzpatrick (1899), Pammel (1896): Woodbury County, based on *T. repens*.

KANSAS*

Gates (1940): Linn County, no specimen documentation.

Great Plains Flora Association (1977): Rush and Crawford counties, based on specimens of *T. repens* and *T. hybridum*, respectively.

MICHIGAN

No literature reports were found but several specimens of *T. repens* were erroneously determined.

MISSOURI*

Steyermark (1963): Boone County, based on *T. stoloniferum* from Cooper County; Jackson County, based on a collection from Independence County, Arkansas.

MONTANA

Great Plains Flora Association (1977): Rosebud County, based on *T. repens*. Booth and Wright (1966) do not list the species.

NEBRASKA

Peterson (1912): Cass and Lancaster counties, based on *T. repens*.

Great Plains Flora Association (1977): Cherry and Grant counties, based on *T. hybridum*.

NEW YORK

Eaton (1818), Beck (1833): western New York without specimen documentation.

Gilbert (1884): Deerfield, Oneida County, based on *T. reflexum* according to House (1924).

OKLAHOMA

Stemen and Myers (1937), Steyermark (1963): no specimen documentation. Waterfall (1969) does not list the species.

PENNSYLVANIA

Muhlenberg (1813): Muhlenberg's specimens at PH have no collection data, thus his report cannot be verified.

Other specimens examined from the state were *T. reflexum* or *T. repens*.

SOUTH DAKOTA

Rydberg (1932): at MO are two sheets, the first "Sow Prairies, Brookings, 10 Jun 1892, *Thornber*," a fragment of *T. beckwithii* Brewer ex S. Wats. The second is labeled "Flora Nebraskana, Bad Lands, Jul 1844, *F. V. Hayden*," but was most likely collected in the present day Bad Lands of South Dakota. The specimen is *T. stoloniferum* but since habitat such as necessary to support the species does not exist in that area it would appear the specimen was erroneously labeled and should be ignored. Van Bruggen (1976) does not list the species.

TENNESSEE

Chapman (1897), Gleason and Cronquist (1963), Small (1933): no specimen documentation.

TEXAS

While literature reports were not found, several sheets of *T. repens* from the Houston and Dallas vicinities were erroneously labeled *T. stoloniferum*. Correll and Johnston (1970) do not list the species.

VERMONT

Perkins (1888): no specimen documentation.

WISCONSIN

No literature reports were found but several specimens of *T. repens* were erroneously determined.

WYOMING

Great Plains Flora Association (1977): Weston County, based on *T. hybridum*.

CANADA

No literature reports found but specimens of *T. hybridum* were found to be erroneously determined.

HABITAT

Specimen data and literature accounts suggest that *Trifolium stoloniferum* most frequently grew in woodlands associated with water courses. Nearly all the specimens provided with adequate locality data came from stations within the drainage basins of the lower Missouri River and Ohio River. Open habitats, e.g. fields, were only referred to a few times and only in one case is a site thought to represent an accidental introduction (Independence County, Arkansas).

The preference of *Trifolium stoloniferum* for woodlands is further corroborated by Mr. H. A. Davis, Freeport, FL, (pers. comm., 1982), the person last known to collect the plant, who described the Preston and Webster county sites as well drained sites in woodlands.

ABUNDANCE

Trifolium stoloniferum was apparently exceedingly local in its occurrence, being known from fewer than 30 sites scattered in 8 states. The possible exception may have been west-central and southwest Ohio where at least nine stations are known to have existed.

It seems obvious that in the latter 18th century while populations of the clover were limited and widely scattered, a good majority must have been quite vigorous. Repeated collections from the same localities over a series of years substantiate this statement. Shortly thereafter, however, the number of collections dwindled rapidly with a mere five sites documented after 1900, three before 1910 and one each in 1937 and 1940. It might be hypothesized that the habitat destruction resulting from the industrial revolution and the inability of *Trifolium stoloniferum* to adapt to changing environmental stresses led to the demise of the species.

CURRENT STATUS

Over 40 years have now elapsed since *Trifolium stoloniferum* was last collected in Webster County, West Virginia, and more recent sightings of the species are unknown to me. Field trips have been made to several sites in Missouri and east-central Kansas without successfully locating extant populations of the plant.

On this basis one can only presume that *Trifolium stoloniferum* is at the very least an endangered species existing in a few as yet undiscovered sites or the species may in fact be extirpated from its range.

Currently *Trifolium stoloniferum* is not listed as an endangered or threatened species by the U. S. Department of the Interior, Fish and Wildlife Service (Fed. Reg. 82495; 50 CFR 17.11 and 17.12). The species was apparently overlooked in previous listing but has now been nominated for review and, presumably, inclusion in future listings.

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UNIVERSITY OF KANSAS HERBARIUM
2045 CONSTANT AVENUE
LAWRENCE, KANSAS 66046